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DEVELOPMENT OF PLANTATIONS ON CROWN LANDS

(Established 1975, Assessed 1985)

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ABSTRACT

In 1985, permanent sample plots established in 1975 plantations were remeasured. Height and diameter were recorded for planted trees, natural conifer reproduction and hardwood competition. The sample of 145 plots presents development data for crown land plantations of black spruce, white spruce and jack pine on the Upsalquitch, Nepisiguit, Lower Miramichi, Upper Miramichi, Fundy and Restigouche-Tobique forest licenses.

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INTRODUCTION

Monitoring the development of crown land plantations commenced in 1980 with the establishment of permanent sample plots in 5 year old plantations across the province.

Plantations were measured periodically to obtain data on height growth (5th year measurements), diameter growth (10th year measurements) and other data affecting plantation development.

To date 1 400 sample plots have been established on crown land plantations throughout the province.

The primary use of the data collected will be to assess growth and yield to support the wood supply projections for provincial crown lands.

All measurement data was collected by the Silviculture Section, Timber Management Branch, Department of Natural Resources and Energy, Province of New Brunswick.

METHODS

Permanent sample plots of 8 metre radius (201 square metre area) were established in random locations across the province in 1975 plantations. Sample intensity was determined as suggested by Krause, 1979[1].

Sample plots containing less than 15 planted trees were not re-measured in 1985.

All planted trees within the sample plot were measured for height and diameter at breast height and numbered. Natural conifer reproduction taller than 50 cm was measured and recorded by species. Trees with diameters less than 3.0 cm were not recorded.

Hardwood species within the 8 metre radius plot, taller than 1 metre, were tallied if fewer than 100 individuals were present. Where there were more than 100 competing hardwoods four 1.0 metre radius subplots were established and hardwood competition data was recorded. Trees larger than 3.0 cm dbh were also recorded on the 8 metre plots in the latter case.

A soil pit was established near the sample plot to provide an estimate of soil drainage. Visual estimates of ground vegetation, slope and aspect were also recorded.

Damage to planted trees was recorded both within and surrounding the sample plots, according to its type, intensity and distribution.

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1 Krause, H.H. 1979. Development and Yield Projections in Forest Plantations, a Proposal for Growth Monitoring in N.B. DNR&E Plantations.

RESULTS

Plantation density when referred to in this report assumes a minimum of 1500 planted trees per hectare. This assumption was used because sample plots containing less than 15 trees were not remeasured in 1985 as they do not represent a fully stocked condition, a criteria for determining growth and construction of normal yield tables.

Examination of tables 1-3 shows that undesirable hardwoods are present in most plantations at the 10th year assessment. Total hardwood densities as high as 21 000 stems per hectare were recorded. Table 7 shows that undesirable hardwood competition exists on 63 percent of the area sampled and was distributed throughout all licenses that were sampled.

Another form of competing vegetation were the natural softwoods. Natural softwoods were contributing to excessive (more than 3 000 acceptable softwood trees per hectare) density on 12 percent of the area sampled (Table 7). This appears to be a condition confined more to the northern licenses.

Total natural softwood densities range from 0 to approximately 9 000 trees per hectare (Tables 1-3). On average total natural softwood densities are less than 1 000 trees per hectare (Tables 1-3).

The height growth of planted trees has increased considerably since the 5th year assessment in 1980. Black spruce appears to have overcome slow initial growth by showing a 256 percent increase in height. Jack pine heights increased 134 percent and 157 percent for bare root and container stock respectively.

Although black spruce showed the greatest change, jack pine was more than 1.5 metres taller than black spruce 10 years following plantation establishment (Table 6).

Diameter measurements were recorded for the first time at the tenth year assessment. Because diameters of trees less than 3.0 cm dbh. were not recorded, the average diameter reported is not a plantation average.

Black spruce averages 3.91 cm dbh., white spruce 3.0 cm and jack pine 5.71 cm (Table 5).

Only one stock type comparison was available in the data. Jack pine bare root stock shows a small advantage over jack pine container stock in both height growth and diameter growth (Table 5).

The best average diameter and height growth was recorded for jack pine paper pots on the Fundy License (Table 5). However, when individual plantations were examined, the best performance was reported in the Lower Miramichi License on jack pine bare root stock (Table 4).

Diameter growth on the Restigouche-Tobique License was the poorest recorded, all trees were less than 3.0 cm dbh. Only black and white spruce bare root stock were represented in the data (Table 4).

SUMMARY

Crown land plantations established in 1975 and assessed in 1985 were meeting minimum density standards of 1 500 trees per hectare. Many plantations exceed the maximum 5th year density standard of 3 000 total softwoods per hectare.

Hardwood competition exists in 63 percent of the sampled area.

TABLE 1
DEVELOPMENT OF SELECTED 1975
BARE ROOT PLANTATIONS ASSESSED 1985
10TH YEAR REPORT

SILVICULTURE TREATMENT NUMBER	PLANTATION NAME	AREA HA.	PLANTED SOFTWOOD		ALL NATURAL SOFTWOOD			ACCEPTABLE[2] NATURAL SOFTWOOD			ALL NATURAL HARDWOOD			NATURAL HARDWOOD COMPETITION[3]		
			AVG. HGT. (m)	AVG. DBH (cm)	AVG. DEN-SITY[1]	AVG. HGT. (m)	AVG. DBH (cm)	AVG. DEN-SITY	AVG. HGT. (m)	AVG. DBH (cm)	AVG. DEN-SITY	AVG. HGT. (m)	AVG. DBH (cm)	AVG. DEN-SITY	AVG. HGT. (m)	AVG. DBH (cm)
101001075BP2	SOUTH CHARLO W	45	54	3.7	1641	1.29	3.3	282	2.34	3.3	4947	3.79	4.9	4791	4.21	4.9
103000175BP1	PISIGUIT BK N	293	4.36	7.0	1293	2.33	4.4	50	4.93	6.1	2656	2.02	5.4	40	5.56	10.6
103000175BP2	PISIGUIT BK S	36	3.92	6.7	0	0.00	0.0	0	0.00	0.0	21088	1.89	0.0	0	0.00	0.0
103000475BP1	TRACADIE S BR	282	3.65	5.4	78	1.79	6.2	0	0.00	0.0	4178	3.68	5.5	924	4.88	5.8
104T00175BP1	TABUSINTAC	86	3.55	5.3	122	3.11	4.6	6	4.80	4.0	15214	3.86	4.5	8328	4.74	4.6
203000675BP1	MEADOW BROOK	105	3.04	5.0	1175	1.60	4.7	75	3.20	5.2	485	1.60	0.0	0	0.00	0.0
203000775BP1	COLD BROOK	24	2.96	4.8	647	1.71	4.1	62	3.37	3.8	858	1.31	0.0	0	0.00	0.0
307000875BP1	BROAD BROOK	117	3.96	6.4	564	2.37	6.5	0	0.00	0.0	6350	2.54	4.1	904	4.59	4.3
307000875BP2	WALTON GLEN BK	46	3.68	5.6	159	1.67	0.0	0	0.00	0.0	11857	2.15	3.4	1273	4.14	3.4
307000875BP3	CHOCOLATE BROOK	114	3.07	5.4	224	2.02	5.3	0	0.00	0.0	4609	1.94	3.5	199	3.28	3.5
510000575BP1	SUMMIT DEPOT	65	1.66	0.0	2661	0.97	0.0	124	2.34	0.0	8356	1.58	0.0	3581	1.93	0.0
510000575BP2	CAMP 67	49	1.03	0.0	1691	1.11	16.0	80	1.26	0.0	5680	1.92	5.3	5073	2.02	5.3

1 DENSITY IN TREES PER HECTARE

2 ACCEPTABLE IS DEFINED IN APPENDIX 9, PAGE 65 OF THE FOREST MANAGEMENT MANUAL. ALSO REFERRED TO AS CRITICAL HEIGHT.

3 COMPETITION INCLUDES ALL HARDWOODS EQUAL TO OR TALLER THAN ACCEPTABLE SOFTWOOD CRITICAL HEIGHT

TABLE 2
DEVELOPMENT OF SELECTED 1975
PAPER POT PLANTATIONS ASSESSED 1985
10TH YEAR REPORT

SILVICULTURE TREATMENT NUMBER	PLANTATION NAME	AREA HA.	PLANTED SOFTWOOD		ALL NATURAL SOFTWOOD			ACCEPTABLE[2] NATURAL SOFTWOOD			ALL NATURAL HARDWOOD			NATURAL HARDWOOD COMPETITION[3]		
			AVG. HGT. (m)	AVG. DBH (cm)	AVG. DEN-SITY[1]	AVG. HGT. (m)	AVG. DBH (cm)	AVG. DEN-SITY	AVG. HGT. (m)	AVG. DBH (cm)	AVG. DEN-SITY	AVG. HGT. (m)	AVG. DBH (cm)	AVG. DEN-SITY	AVG. HGT. (m)	AVG. DBH (cm)
101001075BP1	SOUTH CHARLO S	46	3.03	5.3	1094	0.90	4.1	0	0.00	0.0	149	2.53	3.2	50	3.15	0.0
101001075BP3	SOUTH CHARLO E	85	2.77	5.4	8634	1.21	4.7	119	3.04	4.5	2835	2.09	4.0	587	3.46	4.1
102T00275BP1	TAYLOR BROOK RD	170	3.76	5.6	9	1.62	0.0	0	0.00	0.0	4806	2.27	3.9	570	4.68	4.2
102T00475BP1	NINE MILE BK	96	3.34	5.2	3817	2.23	4.3	87	3.74	4.5	2425	3.06	4.5	1020	4.85	4.6
103000175BP1	PISIGUIT BK N	293	4.35	6.8	865	2.94	5.5	20	4.97	8.1	12414	3.10	6.7	428	6.16	7.2
103000275BP1	TRACADIE S BR	112	3.26	5.6	113	1.81	4.7	5	3.95	6.3	4128	2.76	5.6	909	4.43	6.1
103T00375BP1	PISIGUIT BK S	126	3.38	6.8	59	2.12	6.4	9	4.58	5.9	9377	4.08	6.2	3070	5.40	6.5
103T00375BP2	PISIGUIT BK N	176	2.82	5.3	81	2.03	4.0	25	3.15	4.1	14137	5.20	5.3	9257	5.61	5.3
103T00375BP3	PISIGUIT BK C	22	4.08	6.7	33	3.21	6.2	0	0.00	0.0	21221	1.82	0.0	0	0.00	0.0
104T00175BP2	TABUSINTAC	197	3.15	5.1	423	1.76	3.7	40	2.91	3.6	5889	3.27	4.5	2198	4.40	4.5
104T00175BP3	TABUSINTAC	93	3.49	5.4	66	1.76	0.0	0	0.00	0.0	7460	3.69	4.5	3432	4.65	4.6
307000875BP1	BROAD BROOK	117	4.30	6.8	348	2.80	4.3	0	0.00	0.0	5645	4.01	4.2	1766	5.21	4.6

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TABLE 3
DEVELOPMENT OF SELECTED 1975
SUMMER CROP PAPER POT PLANTATIONS ASSESSED 1985
10TH YEAR REPORT

SILVICULTURE TREATMENT NUMBER	PLANTATION NAME	AREA HA.	PLANTED SOFTWOOD AVG. HGT. (m)	PLANTED SOFTWOOD AVG. DBH (cm)	ALL NATURAL SOFTWOOD AVG. DEN-SITY[1]	ALL NATURAL SOFTWOOD AVG. HGT. (m)	ALL NATURAL SOFTWOOD AVG. DBH (cm)	ACCEPTABLE[2] NATURAL SOFTWOOD AVG. DEN-SITY	ACCEPTABLE[2] NATURAL SOFTWOOD AVG. HGT. (m)	ACCEPTABLE[2] NATURAL SOFTWOOD AVG. DBH (cm)	ALL NATURAL HARDWOOD AVG. DEN-SITY	ALL NATURAL HARDWOOD AVG. HGT. (m)	ALL NATURAL HARDWOOD AVG. DBH (cm)	NATURAL HARDWOOD COMPETITION[3] AVG. DEN-SITY	NATURAL HARDWOOD COMPETITION[3] AVG. HGT. (m)	NATURAL HARDWOOD COMPETITION[3] AVG. DBH (cm)
101001075BP2	SOURTH CHARLO W	45	1.86	3.8	696	0.94	0.0	0	0.00	0.0	7361	5.48	5.5	5769	5.63	5.5

1 DENSITY IN TREES PER HECTARE

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3 COMPETITION INCLUDES ALL HARDWOODS EQUAL TO OR TALLER THAN ACCEPTABLE SOFTWOOD CRITICAL HEIGHT

TABLE 4
SPECIES DEVELOPMENT OF SELECTED 1975
PLANTATIONS ASSESSED IN 1985
10TH YEAR REPORT

SILVICULTURE TREATMENT NUMBER	AREA (ha)	PLANTED SOFTWOOD SPECIES	STOCK TYPE	HEIGHT (m)	DBH (cm)	METHOD OF SITE PREPARATION
101001075BP1	46	jP	PP	3.03	5.3	Burn & Shark Fin Barrels
101001075BP2	45	bS	BR	1.64	3.7	Burn & Shark Fin Barrels
		jP	SCPP	1.86	3.8	Burn & Shark Fin Barrels
101001075BP3	85	jP	PP	2.77	5.4	Burn & Shark Fin Barrels
102T00275BP1	170	jP	PP	3.76	5.6	Burn & Bracke
102T00475BP1	96	jP	PP	3.34	5.2	Crusher
103000175BP1	293	jP	BR	4.36	7.0	Finnish Plow
		jP	PP	4.35	6.8	Finnish Plow
103000175BP2	36	jP	BR	3.92	6.7	Disc Trencher
103000275BP1	112	jP	PP	3.26	5.6	Finnish Plow
103000475BP1	0282	jP	BR	3.65	5.4	Finnish Plow
103T00375BP1	176	jP	PP	3.38	6.0	Finnish Plow
103T00375BP2	176	jP	PP	2.82	5.3	Finnish Plow
103T00375BP3	22	jP	PP	4.08	6.7	Finnish Plow
104T00175BP1	86	jP	BR	3.55	5.3	C & H Plow
104T00175BP2	197	jP	PP	3.15	5.1	C & H Plow
104T00175BP3	93	jP	PP	3.49	5.4	C & H Plow
203000675BP1	105	jP	BR	3.04	5.0	Marden Roller
203000775BP1	24	jP	BR	2.96	4.8	Shark Fin Barrels
307000875BP1	117	jP	BR	3.96	6.4	Shark Fin Barrels
		jP	PP	4.30	6.8	Shark Fin Barrels
307000875BP2	46	jP	BR	3.68	5.6	Shark Fin Barrels
307000875BP3	114	bS	BR	2.48	3.9	Shark Fin Barrels
		jP	BR	4.12	6.5	Shark Fin Barrels
510000575BP1	65	bS	BR	1.66	0.0	Root Rake
510000575BP2	49	wS	BR	1.03	0.0	Root Rake

PP = paper pot; BR = bare root; SC = summer crop
jP = jack pine; bS = black spruce; wS = white spruce

TABLE 5
LICENSE AVERAGES OF SELECTED 1975 PLANTATIONS
TEN YEARS AFTER PLANTING

LICENSE	STOCK TYPE	PLANTED SOFTWOOD HGT. (m)	PLANTED SOFTWOOD DBH (cm)	BLACK SPRUCE HGT. (m)	BLACK SPRUCE DBH (cm)	WHITE SPRUCE HGT. (m)	WHITE SPRUCE DBH (cm)	JACK PINE HGT. (m)	JACK PINE DBH (cm)	RED PINE HGT. (m)	RED PINE DBH (cm)	LARCH HGT. (m)	LARCH DBH (cm)	NORWAY SPRUCE HGT. (m)	NORWAY SPRUCE DBH (cm)	OTHERS HGT. (m)	OTHERS DBH (cm)
UPSALQUITCH	BR	1.64	3.73	1.64	3.73	-	-	-	-	-	-	-	-	-	-	-	-
	PP	2.81	5.36	-	-	-	-	2.81	5.36	-	-	-	-	-	-	-	-
	SCPP	1.86	3.80	-	-	-	-	1.86	3.80	-	-	-	-	-	-	-	-
	AVG.	2.39	5.26	1.64	3.73	-	-	2.68	5.30	-	-	--	-	-	-	-	-
NEPISIGUIT	PP	3.59	5.46	-	-	-	-	3.59	5.46	-	-	-	-	-	-	-	-
	AVG.	3.59	5.46	-	-	-	-	3.59	5.46	-	-	-	-	-	-	-	-
LOWER MIRAMICHI	BR	3.43	5.69	-	-	-	-	3.43	5.69	-	-	-	-	-	-	-	-
	PP	3.43	6.00	-	-	-	-	3.43	6.00	-	-	-	-	-	-	-	-
	AVG.	3.43	5.86	-	-	-	-	3.43	5.86	-	-	-	-	-	-	-	-
UPPER MIRAMICHI	BR	3.55	5.31	-	-	-	-	3.55	5.31	-	-	-	-	-	-	-	-
	PP	3.22	5.17	-	-	-	-	3.22	5.17	-	-	-	-	-	-	-	-
	AVG.	3.33	5.22	-	-	-	-	3.33	5.22	-	-	-	-	-	-	-	-
FUNDY	BR	3.55	5.83	2.48	3.92	-	-	3.84	6.03	-	-	-	-	-	-	-	-
	PP	4.30	6.85	-	-	-	-	4.30	6.85	-	-	-	-	-	-	-	-
	AVG.	3.61	5.92	2.48	3.92	-	-	3.88	6.11	-	-	-	-	-	-	-	-
RESTIGOUCHE-TOBIQUE	BR	1.20	-	1.66	-	1.03	-	-	-	-	-	-	-	-	-	-	-
	AVG.	1.20	-	1.66	-	1.03	-	-	-	-	-	-	-	-	-	-	-
PROVINCE	BR	3.10	5.69	2.03	3.91	1.03	-	3.56	5.75	-	-	-	-	-	-	-	-
	PP	3.42	5.68	-	-	-	-	3.42	5.68	-	-	-	-	-	-	-	-
	SCPP	1.86	3.80	-	-	-	-	1.86	3.80	-	-	-	-	-	-	-	-
	AVG.	3.26	5.68	2.03	3.91	1.03	-	3.47	5.71	-	-	-	-	-	-	-	-

STOCK TYPES - BR = Bare root, PP = paper pot, SCPP = summer crop paper pot

Table 6

Comparison of Height Growth
Between 5th and 10th Year Assessments
For New Brunswick Plantations

Assessment Period	Black Spruce BR	Black Spruce PP	Jack Pine BR	Jack Pine PP
5th	0.57	-	1.52	1.33
10th	2.03	-	3.56	3.42
Percent Increase	256		234	157

Table 7

Plantation Performance by License
Ten Years After Planting

License	Area Ha.	Percent of Area[2] With Acceptable Softwood Density 1 500 - 3 000 Trees per Hectare	Percent of Area With Hardwood Competition[4] More than 500 Trees per Hectare
Upsalquitch	221	100 (59)[3]	79
Nepisiguit	266	100 (36)	100
Lower Miramichi	1 469	100 (0)	47
Upper Miramichi	376	100 (0)	100
Kent	NS[1]		
Queen's Charlotte	NS		
Fundy	394	100 (0)	41
York	NS		
Carleton	NS		
Restigouche-Tobique	114	100 (100)	100
Total	2 840	100 (12)	63

[1]NS - no sample data available.
[2]Acceptable softwood assumes a minimum of 1 500 planted trees and other softwoods except balsam fir which acheived critical height.
[3]Figures in brackets are for total softwood densities including balsam fir, exceeding 3 000 stems per hectare.
[4]Competition includes all hardwoods equal to or taller than acceptable softwood critical height.